Amendments to Claims:

This listing of claims will replace all prior revisions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A method for controlling a physical variable at a frequency of interest (f_d) including the steps of:

a) sampling the physical variable at a sample frequency less than twice the frequency of interest (f_d);

b) calculating at least one control command based upon the sampling of the physical variable; and

c) generating a force for controlling the physical variable based upon the control command.

2. (Original) The method of Claim 1, further including the steps of:

bandpass filtering the physical variable prior to said step a).

3. (Original) The method of Claim 2 wherein said bandpass filter extracts a frequency range with a lower bound generally given by $(2n-1)*f_s/2$ and an upper bound generally given by $(2n+1)*f_s/2$, where n is an integer chosen so that the frequency of interest (f_d) is within the extracted frequency range.

4. (Previously Presented) The method of claim 1 wherein said physical variable includes information within a bandwidth including said frequency of interest and wherein said sampling frequency is at least twice the bandwidth of this information.

5. (Original) The method of claim 1 further including the step of generating the at least one control command at a rate less than twice the frequency of interest.

6. (Original) A method for computing control commands at a reduced rate in a noise or vibration control system including the steps of:

a) sensing a physical variable;

b) identifying harmonic components (a_k, b_k) of the physical variable at a frequency of interest (f_d);

c) down-sampling the harmonic components (a_k, b_k) to a lower update frequency (f_u);

d) performing control computations on the harmonic components(a_k, b_k) at the lower update frequency (f_u); and

e) generating control commands based upon the control computations.

7. (Original) The method of Claim 6 further including the step of:

f) generating harmonic components of the control commands in said step e).

8. (Original) The method of Claim 7, further including the step of:

g) generating a control output at a frequency higher than the lower update frequency.

9. (Original) The method of Claim 6 further comprising:

low-pass anti-aliasing filtering to prevent aliasing in sampling at a lower update frequency (f_u).

10. (Original) The method of Claim 6, further comprising:

obtaining estimates of the harmonic components by computing a fast-Fourier transform of the physical variable; and

extracting the result corresponding to the frequency of interest (f_d).

11. (Original) The method of Claim 6, wherein said physical variable comprises a plurality of physical variables, said method further including the steps of:

f) generating a sensed signal as a function of each of said plurality of physical variables; and

g) computing harmonic estimates z_k for each sensed signal y_k at each sample time t_k according to $z_k=z_{k-1}+\rho H(y_k-H^T z_{k-1})$, where:

$H=[\ 1 \cos(f_d\ t_k) \sin(f_d\ t_k) \cos(f_x t_k) \sin(f_x t_k), \ldots]^T$ and where:

$f_d t_k$= desired frequency;

$f_x t_k$= frequency of unwanted information in y_k;

z_k = estimates of harmonic content of y_k at time k;

z_{k-1} = estimates of harmonic content at time k-1;

ρ= a variable gain that determines the corner frequency of the first order low-pass anti-aliasing filter;

y_k = sensed signal vector at time k;

$(\cdot)^T$= transpose of a vector or matrix.

12. (Original) The method of Claim 11, further comprising

utilizing every N^{th} harmonic estimator output z_{Nk} where N is the ratio of the sampling frequency and the update frequency (f_s/f_u).

13. (Original) The method of Claim 11, further comprising:

generating separate control commands for each of multiple tones;

adding control commands for each tone; and

outputting a sum of the control commands for each tone to one or more force generators.

14. (Original) A method for analyzing a physical variable having a first frequency of interest f_1 and a second frequency of interest f_2 including the steps of:

a) identifying first harmonic components a_{k1}, b_{k1} of the first frequency of interest f_1;

b) down-sampling the harmonic components a_{k1}, b_{k1} at an intermediate frequency f_{u1};

c) identifying second harmonic components a_{k2}, b_{k2} of a difference between the first frequency of interest f_1 and the second frequency of interest f_2;

d) downsampling the harmonic components a_{k2}, b_{k2}at an update frequency f_{u2}; and

e) analyzing information at the first frequency of interest f_1 and the second frequency of interest $f_2$based upon said harmonic components a_{k1}, b_{k1} and a_{k2}, b_{k2}.

15. (Original) The method of Claim 14 wherein the intermediate frequency f_{u1} is higher than the update frequency f_{u2}.

16. (Original) The method of Claim 14 further including the steps of:

f) generating control signals at the update frequency f_{u2} based upon said step e).

17. (Original) An apparatus for sensing physical variables at a reduced rate comprising:

a sensor adapted to sense physical variables and to generate a sensed signal as a function of the sensed physical variable; and

a control circuit adapted to establish a frequency of interest (f_d), and to establish a sample frequency (f_s),

wherein the control circuit filters the sensed signals to extract a frequency range with a lower bound given by $(2n-1)*f_s/2$ and an upper bound given by $(2n+1)*f_s/2$, where n is an integer chosen so that the frequency of interest (f_d) is within the extracted frequency range.

18. (Original) The apparatus of Claim 17, wherein the control circuit attenuates the filtered sensed signal at a frequency less than the frequency of interest (f_d) by high-pass anti-aliasing to produce a resultant signal.

19. (Original) The apparatus of Claim 17 wherein the control circuit aliases the filtered sensed signal to a lower frequency when there is no information present at the lower frequency in the sensed signal and the control circuit extracts desired information.

20. (Previously Presented) The method of claim 1 wherein the physical variable is sound or vibration.

21. (Previously Presented) The method of claim 20 wherein the force is sound or vibration.

22. (New) The method of claim 21 wherein the force generated in said step c) reduces the amplitude of the physical variable.

23. (New) The method of claim 22 wherein the force is generated in said step c) by an actuator, the actuator generating the force based upon the control command.